



<b>IN THE UNITED STATES PATENT AND TRADEMARK OFFICE</b>	<i>Application Number</i>	09/759,345
	<i>Filing Date</i>	January 16, 2001
	<i>First Named Inventor</i>	Douglas H. ROBINSON
	<i>Group Art Unit</i>	1645
	<i>Examiner Name</i>	Robert Zeman
	<i>Attorney Docket Number</i>	2149-107
<i>Title of the Invention:</i> <b>METHODS FOR THE ISOLATION OF BACTERIA CONTAINING EUKARYOTIC GENES</b>		

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### SUBMISSION OF AMENDED APPEAL BRIEF

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

In response to the Notification of non-compliance with 37 C.F.R. §1.192(c) dated October 15, 2003, Applicant submits the attached amended appeal brief. The undersigned believes that this amended appellant's brief only differs from the brief originally submitted on August 1, 2003 in that section IV has been updated and that section V has been amended to contain a concise explanation of the invention, referring to the specification by page and line number as requested in the notice of non-compliance.

Consideration of this amended appeal brief is respectfully requested.

No fee is believed to be due. However, the Commissioner is authorized to charge any fee required for the consideration of the accompanying papers to RFEM's Deposit Account No. 02-2135.

RESPECTFULLY SUBMITTED,					
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### **AMENDED APPELLANT'S BRIEF**

Applicant appeals from the Final Rejection of the claims of the above-referenced patent application dated September 23, 2002. The fee required by 37 C.F.R. §1.17(c), a petition pursuant to 37 C.F.R. §1.116(a) and the fee required for a four month extension of time accompany this brief. The Commissioner is authorized to charge any underpayment or credit any overpayment to deposit account No. 02-2135. The current claims of this application are reproduced in Appendix A.

#### **I. REAL PARTY IN INTEREST**

The named inventor is the real party in interest in this appeal.

#### **II. RELATED APPEALS AND INTERFERENCES**

Applicants are unaware of any appeals or interferences related to the subject matter of this appeal.

#### **III. STATUS OF CLAIMS**

Claims 1-29 are currently pending and are under final rejection as a result of the Office Action mailed September 23, 2002 (Paper 8). Claims 1-29 are appealed.

#### **IV. STATUS OF AMENDMENTS**

The following amendments to the claims were filed concurrently with the original brief:

3. The method according to claim 2 which further comprises subjecting the cells to ~~an~~ a final aerobic culturing step.

26. A cell according to claim 24 that is a ~~bacteria~~ bacterium.

28. A cell according to claim 25 that is a ~~bacteria~~ bacterium.

These amendments have not been entered.

#### **V. SUMMARY OF THE INVENTION**

The present invention relates to methods for producing a bacterium that contains a eukaryotic and/or viral gene, which comprises culturing virally-infected eukaryotic cells under low oxygen conditions to produce a bacterium containing a eukaryotic and/or viral gene (claim 1). Under a preferred embodiment of the invention, the method comprises the steps of (a) culturing virally-infected eukaryotic cells under anaerobic conditions with at least one exposure to aerobic or microaerophilic conditions (claim 2), (b) culturing cells from step (a) under aerobic conditions (claim 3), and (c) isolating at least one bacterium that contains a eukaryotic or viral gene (claim 15). The invention also relates to cells produced by the claimed methods (claim 24).

The unusual feature of the claimed invention is that by utilizing the methods thereof, it is possible to produce, from a culture of eukaryotic cells, altered cells that have all the morphological characteristics of bacteria (i.e., would be classified as "bacteria" by the objective observer), yet contain one or more eukaryotic or viral genes in their genome without introducing the genes into a bacterial culture by traditional molecular biological techniques. While not wishing to be bound by theory, it appears that the methods of

this invention result in "de novo speciation" or "de-evolution" of the eukaryotic cells into bacterial forms. By the exercise of scrupulous attention to sterility, and the use of multiple controls in the methods, it has been confirmed that the bacteria produced are not the product of contamination at any point in the process and so are not the result merely of contaminating bacteria overgrowing the starting eukaryotic cell culture.

The method is useful for producing bacteria that contain and express a variety of eukaryotic and/or viral proteins. Such cells can be used in fermentation culture to produce these proteins in quantity for use as medicines, diagnostic agents, etc., or can be used to produce vaccines, as well as for any number of other purposes for which traditionally-produced transgenic bacteria are used.

Support for claim 1 can be found, for example, on page 6, lines 27-30, support for claim 2 can be found, for example, on page 9, lines 15-18, support for claim 3 can be found, for example, on page 9, lines 18-21, and support for claim 15 can be found in the same sections of the application. Claims 4 and 5 specify that the anaerobic culturing conditions of claim 2 comprise an atmosphere containing less than or equal to 1 v/v% oxygen and less than 0.1 v/v% oxygen, respectively. Support for these claims can be found on page 11, lines 28-31. Claims 6 to 8 require that the virally-infected eukaryotic cells of claim 1 are retrovirally-infected mammalian, human, or mammalian, avian or fish cells, respectively. Support for these claims can be found, for example, on page 16, lines 12-18. Claim 9 specifies that the mammalian, avian or fish cell is an endothelial cell. Support for this claim can be found, for example, on page 10, lines 10-12. Claim 10 defines the eukaryotic cell of claim 1 as a mammalian brain capillary endothelial cell. Support for this claim can be found, for example, on page 10, lines

10-12. Claims 11 and 12 specify that the virally-infected cell of claim 1 is infected with murine L-cell virus, simian immunodeficiency virus (SIV), human immunodeficiency virus (HIV), Ableson murine leukemia virus or Moloney murine leukemia virus. Support for claims 11 and 12 can be found, for example, on page 10, lines 17-20. Claims 13 and 14 require that the culturing step of claim 1 is carried out at a temperature between about 20 and about 50° C, and at about 37° C, respectively. Support for these claims can be found, for example, on page 11, lines 8-11. Claims 16 and 17 specify that the aerobic culturing step (b) in claim 15 is carried out in an atmosphere containing at least 0.1 v/v% and more than 1 v/v% oxygen, respectively, based on the total volume of atmosphere. Support for these claims can be found, for example, on page 11, line 28 to page 12, line 5. Claims 18 and 19 define the virally-infected eukaryotic cell of claim 15 as a retrovirally-infected mammalian endothelial cell (claim 18) or a human brain capillary endothelial cell infected with the murine L-cell virus (claim 19), respectively. Support for these claims can be found, for example, on page 10, lines 10-12. Claims 20 to 23 introduce a step of filtering the cells cultured in step (a) prior to said aerobic culturing step (b) of claim 1 (claim 20), wherein the cells are filtered through a 0.1 to 0.8  $\mu\text{m}$  (claim 21), a 0.1 to 0.45  $\mu\text{m}$  (claim 22), or a 0.22  $\mu\text{m}$  (claim 23) filter. Support for these claims can be found, for example, on page 13, lines 11 to 30. Claims 24 and 25 are both directed at a pleiomorphic cell that is not a transgenic cell, and is derived from a eukaryotic cell, containing at least one gene evolved from the genome of said eukaryotic cell, prepared by a process according to claim 1 or claim 15, respectively. This pleiomorphic cell is, according to claims 26 to 29, bacterial or has morphology that

is neither prokaryotic nor eukaryotic. Support for these claims can be found, for example, on page 29, lines 10-22.

## **VI. ISSUES**

A first issue is whether or not the subject matter of claims 1-29 meets utility requirements of 35 U.S.C. § 101. The Patent Office maintains that because the claims are drawn to a method for "producing" a bacterium, the claims call for the "creation" of a new species and/or "creation of a life form," and are hence based on an incredible utility and are inoperative. Applicant argues that a) the claims are not directed to the "creation of a new life form" or "spontaneous generation of a life form," but rather to de novo speciation of a bacterial cell from a culture of eukaryotic cells and b) regardless of possible doubts, the Applicant has shown through data presented in the specification and in an independent reproduction of the work, that the method does, in fact, function and therefor is demonstrably operative.

A second issue is whether or not a deposit has been made in accordance with the Budapest Treaty. The Patent Office asserts that compliance with the requirements of 35 U.S.C. §112, first paragraph requires that a deposit of micro-organisms be made under the Budapest Treaty. Applicant argues that such deposits have, in fact, been made, as is stated in the presumptively accurate disclosure of the specification, and as was repeated in the last response prior to issuance of the final Office Action. Applicant is prepared to submit copies of certificates of deposits made by the applicant and again declare that the provisions of the Budapest Treaty have been met, if the veracity of statements in the specification is doubted.

A third issue is whether or not claims 1-29 are enabled by the specification as required by 35 U.S.C. §112, first paragraph. The Patent Office asserts that the specification is enabled for *isolating* a bacterium, it does not reasonably provide enablement for *producing* a bacterium, or for producing any an all bacteria. Applicant argues a) that the examples of the application show that the methods in fact do function to produce a bacterium as claimed, and further that independent reproduction of the experiments described in the specification confirms that the specification is enabling, and 2) that the specification need not enable production of "any and all" bacteria in order to fulfill the requirements of §112, first paragraph.

A fourth issue is whether or not claims 1-29 meet the definiteness requirement of 35 U.S.C. §112, second paragraph. The Patent Office asserts that the claim term "low oxygen conditions" is indefinite, and the recitation of culture steps under "low oxygen conditions" and under "anaerobic conditions" within the same claim is contradictory and confusing. Applicant argues that the term is specifically and clearly defined in the specification in a manner consistent with its accepted meaning in the art, and is therefore definite, and that the recitation of two different culture conditions for two different steps in a multi-step process does not render the claim contradictory or confusing. The Patent Office also asserts that the claims fail to set forth the subject matter which the applicant regards as his invention, asserting a lack of correspondence in scope between the claims and the way in which the applicant has characterized the invention in its arguments before the Patent Office. The applicant argues that there is no inconsistency between the claims and any characterization of the invention made by the applicant, either in the specification or in subsequent argument. The Patent



Office asserts that the use of the terms "derived," "evolved," "pleiomorphic" and "morphology that is neither eukaryotic nor prokaryotic" render the claims indefinite. The applicant argues that these claims have well-established meanings in the art and/or are expressly defined in the specification, and thus would be understood by a person having ordinary skill in the art, and are as definite as the subject matter permits.

A fifth issue is whether or not claims 24-29 meet the written description requirement of 35 U.S.C. § 112, second paragraph. The Patent Office asserts that the claim limitation that the claimed cell is not a transgenic cell is not supported by a written description in the specification. Applicant argues that the Patent Office is applying an improper *in haec verba* test, and that a person of ordinary skill in the art would have understood that what was being described and claimed was a cell that was not a transgenic cell.

## **VII. GROUPING OF THE CLAIMS**

Claims 1-29 are grouped together with regard to the issues of utility, enablement and indefiniteness based on alleged lack of correspondence in scope between the claims and the specification.

Claims 1-23, 26 and 28 are grouped separately from claims 24, 25, 27 and 29 with regard to the issues of written description and indefiniteness based on the use of the allegedly vague claim terms "derived," "evolved" "pleiomorphic" and "morphology that is neither prokaryotic nor eukaryotic."

## **VIII. ARGUMENT**

### **A. Issues raised in the Office Action about which there is no real dispute**

The Office Action raises two issues about which there is no real dispute. First, the examiner has maintained a non-statutory double patenting rejection on the claims as obvious over claims 1-14 of commonly-owned U.S. Patent No. 6,022,730. Paper 8, pages 3-4. Applicant has indicated that an appropriate terminal disclaimer while be filed if any claims subject to this rejection are held allowable. Second, the examiner has objected to claims 26 and 28 due to an informality in the claim language. Paper 8, page 13. This informality has been corrected by an amendment filed concurrently herewith.

**B. Rejection under 35 U.S.C. § 101**

The examiner has maintained the rejection of all claims under § 101 because "the claimed invention is not supported by either a credible asserted utility or a well established utility, as the disclosed invention is inoperative." Paper 8, page 4. The examiner focuses on the use of the claim term "producing," and maintains that this is synonymous with spontaneous generation of life. Paper 8, pages 5-6. This position is based entirely on semantics and is not reasonably based on either the written description or the positions taken by the applicant during this prosecution.

Contrary to the examiner's assertion, the specification shows by provision of detailed protocols and actual data, that the claimed invention is operative. Furthermore, the applicant has submitted a detailed report, accompanied by declarations, that demonstrates through independent corroboration of the results reported in the specification, that the claimed methods do indeed work. What the applicant has invented is a method that allows one to take cultured retrovirally-infected eukaryotic cells, uncontaminated with bacteria, subject them to a series of specific

culturing conditions, and obtain at the end a culture of what, from a morphological point of view, can only be described as "bacteria," which contain intact eukaryotic and/or viral genes. The claims express and describe, within the limits of the English language, these methods. With reference to the written description, a person having ordinary skill in the art would clearly understand that the applicant is not claiming "spontaneous generation" of life (i.e., the creation of life from lifeless matter), but rather a process that results in the alteration of a living life form. Conceptually, this is no different from what is achieved by such techniques as DNA transformation of a plant cell to express one or more bacterial cells, creation of a transgenic mouse, or whole-genome replacement such as what is done with modern cloning methods, and is no more "spontaneous generation" than those are.

According to the Revised Interim Utility Examination Guidelines Training Materials (hereinafter "Utility Guidelines"), "When an applicant has specifically asserted that an invention has a particular utility, that assertion cannot simply be dismissed by the Office personnel as being 'wrong.'" Utility Guidelines, page 5. Likewise, it is not proper to simply conclude that a particular utility is not credible, particularly in the face of contrary evidence:

An assertion is credible unless (A) the logic underlying the assertion is seriously flawed, or (B) the facts upon which the assertion is based are inconsistent with the logic underlying the assertion. Credibility as used in this context refers to the reliability of the statement based on the logic and facts that are offered by the applicant to support the assertion of utility. A *credible* utility is assessed from the standpoint of whether a person of ordinary skill in the art would accept that the recited or disclosed invention is currently available for use.

Utility Guidelines, page 5 (underlying added for emphasis). In the present case, the examiner's rationale for refusing to accept the factual evidence presented in support of the asserted utility is entirely premised on the characterization of the invention as being directed to "spontaneous generation," a term as loaded with meaning in the biological sciences as the term "perpetual motion" is in the physical sciences. The examiner never addresses the fact that evidence in the specification, and in the subsequently submitted Declarations in corroboration, indisputably shows the operability of the claimed invention. Instead, the examiner dismissed this evidence by saying that "said Declarations are not commensurate in scope with the instant claims." Paper 8, page 6. This is contrary to the examiner's own logic, however, as the basic premise underlying the rejection is that it simply is not possible to achieve the asserted result with the claimed method, while the examiner's dismissal of the evidence in support of utility acknowledges that the methods do function to obtain novel bacteria from cultured eukaryotic cells (i.e., it shows operability for some embodiments, but not for the "full scope" of the claims).<sup>1</sup>

Reviewing the evidence in the record that supports utility, two Declarations under 37 C.F.R. § 1.132 were filed in the parent case, Serial No. 08/719,367, and re-submitted with the most recent Amendment in this case. One Declaration is by the inventor, Dr. Douglas Robinson, Ph.D., and one is by an independent scientist, Dr. Anton Steuer,

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<sup>1</sup>The examiner does use the term "isolating" when describing what the evidence shows, and to the extent this is intended to imply that the method simply results in the isolation of contaminating bacteria, this is squarely contradicted by the evidence, which demonstrates within the limits of scientific proof that there were no contaminating bacteria in the starting cell cultures.

Ph.D., who conducted a rigorous confirmation of the experiments reported in the present application. Both of these Declarations present independent corroboration of the utility of the claimed methods.

The Robinson Declaration presents a "Final Report" prepared by Microbiological Associates, Rockville, Maryland (hereinafter "MA") at the request of Dr. Robinson. The experiments requested by Dr. Robinson were for the purpose of reproducing the process described in the present application. Robinson Declaration, paragraphs 4-5; Steuer Declaration, paragraph 3. The Steuer Declaration presents additional detail regarding the work performed at MA. Dr. Steuer is the scientist who supervised the experiments by MA that corroborated the operability and utility of the claimed methods, and is an expert in the field of cell culturing techniques. Dr. Steuer also is one of the scientists employed by Microbiological Associates who signed the Final Report. Robinson Declaration, Paragraph 5; Steuer Declaration, paragraph 2. The "Final Report" states in its Conclusion that

"Two runs involving the periodic reintroduction of an aerobic atmosphere during an anaerobic eukaryotic cell culture phase resulted in the isolation of bacteria, specifically *Bacillus licheniformis*. . . . The isolation of bacteria from eukaryotic cells subjected to alternating anaerobic/aerobic cell culture conditions provides supporting evidence for the hypothesis of *de novo* evolution of bacteria from eukaryotic cells. On the other hand, the possibility of environmental contamination as the source of the bacterial isolates cannot be absolutely eliminated. Environmental contamination is unlikely due to the cGMP compliance procedures and practices employed in the performance of the sterility assays, which includes a stringent environmental and personnel monitoring program. Also, no tube, plate, or bottle inoculated with eukaryotic cell control samples or media control samples showed any microbial outgrowth. These negative results for all the numerous control samples tested minimized significantly the possibility of environmental contamination."

(emphasis added)

The work reported in the Final Report was carried out under tightly-controlled sterility conditions and GMP. The results showed that neither the eukaryotic cell cultures used, nor the media, nor the equipment, showed any detectable microbial contamination -- in other words, there were no bacteria in any of the starting materials used, and none were introduced during the experiments. The Final Report also shows conclusively that microorganisms having all of the morphological characteristics of bacteria were isolated from the culture at the end of each of four experimental runs.

Dr. Steuer's Declaration explains the rigorous standards employed during the testing procedure to ensure that the starting material was not contaminated and that contamination did not arise during the course of the cell culturing procedures. Steuer Declaration, paragraphs 3-4 & 6. The equipment and procedures used at MA for this work met or exceeded the most rigorous standards present in the industry (Steuer Declaration, paragraph 6), and complied with, among others, the U.S. FDA Good Laboratory Practice Regulations, the U.S. E.P.A. GLP's, the United Kingdom CLP Compliance Programme, and the Japanese GLP Standard. Steuer Declaration, paragraph 7.

Dr. Steuer explains why, in his professional opinion, the production of bacteria was not due to "contamination." Steuer Declaration, paragraphs 8-10. In Dr. Steuer's opinion, the Patent Office had "applied a requirement of 'proving' a lack of contamination that is not applied by persons skilled in this field." Steuer Declaration, paragraph 8. It is Dr. Steuer's professional opinion that "any scientific inquiry wherein

one must 'rule out' contamination, as set forth in the Office Action<sup>2</sup>, is meaningless." Steuer Declaration, paragraph 8. As set forth in the Steuer Declaration, the claimed process was shown to produce bacteria upon anaerobic/aerobic culturing of virally-infected eukaryotic cells. Moreover, the report contains a Quality Assurance statement showing that FDA and EPA Good Laboratory Practices were followed. The report concludes that "[e]nvironmental contamination is unlikely," thus overcoming the Patent Office's position that the results were attributable to contamination.

Taken together, these Declarations establish the utility of the claimed methods, by demonstrating that they are, in fact, operative by any standard applied by persons of ordinary skill in the art. This evidence *cannot* be simply dismissed by the examiner, but must instead be rebutted by equally credible evidence or reasoned argument. This the examiner has not done, but has rather rested the entire rejection on the mischaracterization that the applicant is attempting to claim "spontaneous generation of life," followed by the assertion that since the claimed "spontaneous generation" simply is not possible, the bacteria produced must be the result of contamination. As the unrebutted evidence shows, this is an improper characterization of the invention and the assertion based thereon therefor is groundless. This rejection was therefore improper and should be reversed.

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<sup>2</sup>Referring to the Office Action in the parent case, Serial No. 08/719,367.

**C. Rejection under 35 U.S.C. § 112, first paragraph (Deposit Requirement)**

The examiner has maintained the requirement for a deposit in accordance with the Budapest Treaty. Paper 8, pages 6-7. This requirement, to the extent it is required at all, has already been met. Samples of the cells obtained in the work reported in the specification Examples have been deposited with the American Type Culture Collection in compliance with the Budapest Treaty, as stated expressly in the specification at page 8, lines 10-13. As none of the claims recite specific bacterial isolates, such deposit should not even be necessary for enablement. The specification further states at page 9, lines 26-28 that suitable starting materials are publicly available, and also provides at page 9, line 29 to page 10, line 2, reference to techniques which can be used to produce additional starting cell cultures. Thus, additional deposits of starting materials are not necessary. Finally, the specification specifically discloses the public availability of all of the eukaryotic cells lines used as starting materials in the Examples, as follows:

<u>Cell line</u>	<u>Availability</u>	<u>Citation to Specification</u>
RT-HCMV	ATCC CRL 11655	page 22, lines 20-22
procine cerebral microvascular endothelial	Robinson, et al.	page 27, lines 17-19
L929	ATCC CCL 1	page 27, lines 19-20
murine lymphoma	ATCC TIB52	page 27, lines 20-21
SV-40 transformed human colon	ATCC CRL 1807	page 28, lines 5-6
human colon adenocarcinoma	ATCC HTB 38	page 28, lines 6-7



If the issue with regard to cell line deposits is that the applicant has somehow failed to make all the necessary statements on the record regarding compliance with the Budapest Treaty, something not entirely clear from the latest Office Action, the applicant is prepared to submit whatever formalities the Patent Office requires in this regard. The availability of these starting materials (which are in the ATCC catalogue and are not cells lines maintained by the applicant) is a matter of public record. However as stated, the applicant is prepared to submit whatever formalities are needed to satisfy the Patent Office in this regard. Therefore, this rejection as articulated is not appropriate and should be reversed.

**D. Rejection under 35 U.S.C. § 112, first paragraph (Enablement)**

The examiner has maintained the rejection of the claims as not being enabled under 35 U.S.C. § 112, first paragraph. The examiner asserts that the specification is enabling for methods of "isolating" a bacterium from aseptically cultured eukaryotic cells, but not for "producing" bacteria, or for "recovering any and all bacteria." Paper 8, pages 10-11. Again, the examiner improperly ignores the evidence of record that demonstrates that the claimed method functions as claimed to produce bacteria containing eukaryotic and/or viral genes from an aseptic culture of retrovirally-infected eukaryotic cells. The examiner insists, in the face of all the evidence to the contrary, that the bacteria produced are the result of contamination of the starting cultures. Paper 8, page 11. The examiner requires that the applicant prove with 100% certainty that there was not a single contaminating bacteria anywhere in the process, a standard of proof that simply does not exist in science or reality. Rather than accepting the clear evidence that, within the limits of scientific detection (which are indeed very accurate),

there was no bacterial contamination at any point in the process, the examiner starts with the conclusion that what the applicant is claiming is impossible and therefor *must* be the result of contamination, and requires the applicant to demonstrate with absolute certainty that it is not.

This has never been the standard for enablement. By definition, this disclosure enables the claims because it teaches (indeed, demonstrates) how to employ the claimed methods to produce a bacterium. "The enablement requirement is met if the description enables any mode of making and using the claimed invention." Engel Industries, Inc. v. Lockformer Co., 20 U.S.P.Q.2d 1300, 1304 (Fed. Cir. 1991). The claims on their face recite methods for producing "a bacterium." Thus, in order to meet the enablement requirements of § 112, first paragraph, the specification need only teach a person of ordinary skill in the art how to produce "a bacterium" (Engel Industries, supra), which it clearly does. In fact, the Robinson and Steuer Declarations confirm and conclusively establish that the methods disclosed in the specification enable the production of a number of different kinds of bacteria. The claimed methods need not lend themselves to producing "any and all" bacteria (this is a limitation inserted by the examiner that does not appear in the claims); the claims do not recite methods for producing specific bacteria, or all bacteria, just a bacterium, any bacterium, generally. In re Angstadt & Griffin, 190 U.S.P.Q. 214, 218 (Applicants are not required to disclose every species of their invention, even in an unpredictable art.) The statement that "the claims lack specific method steps for the recovery of the bacteria" (Paper 8, page 11) is irrelevant -- the method does not necessarily require the isolation

of the bacteria, and the Patent Office has provided no reason why such a step is required for enablement.

Additionally, the Office Action makes clear that the examiner has fundamentally misconstrued the nature of the invention in making this rejection. At page 11, the examiner that "it is unclear that the claimed method would be suitable for the recovery of any and all bacteria, a few of which may be present, but not detectable by certain means." Similar statements throughout the Office Action make clear that the examiner refuses to accept, in the face of contrary evidence, that the products of the claimed methods are not the result of bacterial contamination of the treated eukaryotic cultures. The specification clearly states that the methods result in the acquisition by eukaryotic cells of all of the morphological characteristics of prokaryotes, and that the production of bacteria is *not* due to the presence of bacteria in the eukaryotic cell cultures. See, e.g., Comparative Examples 1/A, 1/B, 1/C, D (specifically page 26, lines 13-18), and 2/A. The Examples all provide considerable detail regarding both precautions taken against incidental contamination, and controls to monitor whether contamination had in fact occurred -- the results all indicated that there was no contamination. The Declarations of record further confirm the accuracy of the specification on this point. Dr. Seuer in particular states that in his expert opinion, the position that the Patent Office took in the parent case, which is essentially the same as that taken in the present Office Action, "is not applied by persons skilled in the art," and such an inquiry is "meaningless" in the context of this invention. Seuer Declaration, paragraph 8. The assumption of the examiner underlying this rejection therefore is incorrect.

The examiner further states that the claimed method is unpredictable. Paper 8, page 11. However, the Declarations accompanying this response conclusively demonstrate that the claimed methods are indeed completely repeatable. The examiner asserts uncertainty about how the method works, stating that it is not clear whether eukaryotic cells are living or dead at some point in the process, and that bacteria are produced under "low oxygen conditions." Paper 8, page 11. However, in Newman v. Quigg, the Federal Circuit stated that:

"While it is not a requirement of patentability that an inventor correctly set forth, or even know, how or why the invention works . . . neither is the patent applicant relieved of the requirement of teaching how to achieve the claimed result, even if the theory of operation is not correctly explained, or even understood."

11 U.S.P.Q. 1340, 1345 (Fed. Cir. 1989). See also Fromson v. Advance Offset Plate, Inc., 219 U.S.P.Q. 1137, 1149 (Fed. Cir. 1983) ("it is axiomatic that an inventor need not comprehend the scientific principles on which the practical effectiveness of his invention rests."). The disclosure of the specification, as confirmed by the experiments discussed in the Robinson and Seuer Declarations, leave no doubt that the methods do indeed work. This is all that is required under § 112.

The examiner asserts that it is unclear how one of skill in the art would determine and assure that the actual viral and/or eukaryotic genes are indeed intact genes picked up, rather than random fragments thereof, or how one would determine if the genes were integrated into the genome. Paper 8, page 12. These assertions again assume that the bacteria produced by the claimed methods are contaminants, which, as discussed above, they are not. The issues raised by the examiner with regard to the genes themselves are not material to the claims. Whether or not the genes (which

term by definition means an intact coding sequence,<sup>3</sup> and is specifically defined as such at page 7, lines 8-12 of the specification), are intact is not pertinent given the accepted definition of a "gene," as is the issue of genomic integration, since the bacteria are formed from the eukaryotic cells. A person of ordinary skill in the art would recognize that any eukaryotic genes present in bacteria produced by the claimed methods would be intact, stable and integrated in the genome, because that would be their condition prior to performance of the claimed methods. In any event, methods for detecting, analyzing, evaluating and characterizing genes are routine procedures for the person of ordinary skill in the art.<sup>4</sup>

On the whole, the evidence of record clearly demonstrates that the claimed method work, and the examiner has presented no contradictory evidence or reasoned argument to rebut of this evidence. Rejection of the claims for lack of enablement therefor is inappropriate, and this rejection should be reversed.

**E. Rejections under 35 U.S.C. § 112, second paragraph (Definiteness)**

**1. "Under low oxygen conditions" indefinite**

The examiner maintained an earlier rejection of claims 1-29 as being indefinite in the use of the term "under low oxygen conditions." Paper 8, pages 12-13. The

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<sup>3</sup>See, Lewin, B., Genes V, page 1242, Oxford University Press (1994), a copy of which is annexed for the Examiner's convenience.

<sup>4</sup>See, e.g., Sambrook, J., et al., Molecular Cloning, A Laboratory Manual, 2d ed., Chapter 9, Cold Spring Harbor Laboratory Press (1989). A copy of the table of contents for Chapter 9, which provides an outline of analytical techniques then available, was submitted with the previous Amendment filed June 24, 2002. The entire chapter is rather voluminous and not strictly necessary to support the applicant's arguments, but the applicant can provide the entire chapter if the Board so requires.

examiner asserts the term is not defined in the specification because the definition states that suitable anaerobic conditions *include* an atmosphere of 0-2 v/v% oxygen, merely identifying one of a multitude of possible concentrations, making it impossible to determine the metes and bounds of the claimed invention. Paper 8, page 13. The Federal Circuit has noted that "[m]athematical precision should not be imposed for its own sake; a patentee has the right to claim the invention in terms that would be understood by persons of skill in the field of the invention." Modine Mfg. Co. v. ITC, 75 F.3d 1545, \_\_\_, 37 U.S.P.Q.2d 1609, 1617 (Fed. Cir. 1996). Applicant submits that the term "low oxygen conditions" would be readily understood in the context of the invention by person of ordinary skill in the art, particularly in view of the definition of the term at page 9, lines 15-18 ("Preferably, the low oxygen conditions comprise alternating anaerobic culturing conditions with at least one brief period of exposure to an aerobic or microaerophilic condition."). The definition is clear, and uses terms having well-established meanings in the art – anaerobic (absence of oxygen), aerobic (presence of oxygen) and microaerophilic (very low levels of oxygen tolerated by microaerophilic organisms). The fact that the specification goes on to state that "aerobic conditions" "include" a particular range of oxygen concentrations does not render this definition vague – the definition comprises any aerobic conditions, with a preferred range of 0-2 v/v% oxygen. This is as precise as the subject matter permits. See Shatterproof Glass Corp. v. Libby-Owens Ford, Co., 758 F.2d 613, 624, 225 U.S.P.Q. 634, 641 (Fed. Cir. 1985) ("if the language is as precise as the subject matter permits, the courts can demand no more"). This rejection is improper and should be reversed.

## **2. Claims 2, 3 and 15 contradictory**

The examiner has also maintained the rejection of claims 2, 3 and 15 as being vague and indefinite and confusing because the claims recite "subjecting the cells to an aerobic culturing step," yet depend from claims (in the case of claims 2 and 3) that recite culturing under "low oxygen conditions." Paper 8, page 13. The examiner asserts that since no "active steps" are defined to separate the two steps they remain contradictory and confusing. Id. The examiner's position is untenable in view of the express definition of "low oxygen conditions" in the specification at page 9, lines 15-18. The specification states that "[p]referably, the low oxygen conditions comprise alternating anaerobic culturing conditions with at least one brief period of exposure to an aerobic or microaerophilic condition." Thus, there is no contradiction between the claims because the embodiments recited in claims 2 and 3 are expressly contained within the definition of the conditions recited in the claim from which they depend. In the case of claim 15, this rejection makes even less sense, as the claim recites expressly a series of method steps:

- "15. A method for producing a bacterium that contains a eukaryotic and/or viral gene, which comprises (a) culturing virally-infected eukaryotic cells under anaerobic conditions with at least one exposure to aerobic or microaerophilic conditions, (b) culturing cells from step (a) under aerobic conditions, and (c) isolating at least one bacterium that contains a eukaryotic or viral gene.

In the interest of expediting allowance of the claims, the applicant proposes amending claim 3 to recite "subjecting the cells to a final aerobic culturing step. This amendment is not believed necessary, but has been submitted concurrently herewith in the event

the Board considers it to be required to overcome this rejection. This rejection should be reversed.

### **3. Failure to set forth the invention**

The examiner has issued a new rejection of claims 1-29 as failing to set forth the subject matter which the applicant regards as his invention. Paper 8, page 14. The examiner cites the applicant's submissions in Paper 7, filed June 24, 2000, wherein it is stated that the genome of the bacteria produced is eukaryotic in nature, in essence "de-evolved" from the starting eukaryotic cell culture. The examiner concludes that the claims reciting "a single eukaryotic gene" thus do not describe this invention. Paper 8, page 15. The examiner again is resorting to semantics in order to support the rejection. The specification makes clear that the genome of the bacteria produced need not comprise the complete genome of the starting eukaryotic cells. Specification, page 7, lines 2-25. The genes might be altered, and the bacteria may also include viral genes, but the bacteria will contain at least one intact eukaryotic gene. Id. This is not at all inconsistent with the statements made by the applicant in Paper 7. First, this statement was made in response to the allegation that there was no evidence that the eukaryotic gene(s) present in the bacteria produced would be intact, stable and integrated into the genome (an issue irrelevant to patentability in any case, see section VIII.D, above), and was merely pointing out that since any eukaryotic gene present in the bacterium was derived from the starting eukaryotic cells, it would clearly be stable, intact and integrated into the genome. Second, the use of the phrase "at least one eukaryotic gene" does not exclude an entire intact genome. So, from either point of view, there is



no inconsistency between the applicant's statements in Paper 7 and the language of the claims. This rejection is improper and should be reversed.

**4. "Derived," "evolved," "pleiomorphic" and "morphology" indefinite**

The examiner has issued a new rejection of claims 24-29 as being indefinite. The examiner, however, has not provided any specifics for the inclusion of claims 26 and 28 in this rejection. Applicant assumes that the inclusion of claims 26 and 28 was an oversight.

The examiner has rejected claims 24 and 25 as being indefinite in the use of the term "derived," asserting that it is not clear what steps are required for "derivation." Paper 8, page 15. However, claims 24 and 25 specifically reference the methods of claims 1 and 15, respectively. Thus, the way in which the claimed cells are "derived" is expressly included in the claim. The examiner has also rejected claims 24 and 25 as being indefinite in the use of the term "evolved." Id. The term is well-understood in the art to mean "changed over time," or a similar meaning; claims 24 and 25 specifically recite that the gene in the claimed cell evolved from a eukaryotic cell treated in accordance with the methods of claims 1 and 15, respectively. The clear meaning is thus that the gene in the claimed cell has been changed from the gene of the starting eukaryotic cell by application of the process of either claim 1 or claim 5. This is as clear a recitation of the invention as the subject matter, and the English language, permits. The examiner also has rejected claims 24 and 25 as indefinite in the use of the term "pleiomorphic cell." Id. This term, synonymous with "pleomorphic," and "polymorphic" in this context, has a well-established meaning. See Webster's Third New International Dictionary definitions of "pleiomorphic," "pleomorphic" and "polymorphic" at pages 1739,

1740 and 1759 (copies attached for the Board's convenience). Contrary to the examiner's assertion, all cells are not pleiomorphic by nature – not all cells exist in several distinct forms or are capable of assuming varying forms. The use of the term in the specification is in complete accordance with the accepted meaning. See, e.g., specification, page 29, lines 10-20 ("morphologies that appear to be of neither a prokaryotic nor a eukaryotic nature were often observed ..."; "... various bizarre morphologies were often observed."). Furthermore, the examiner's statement that "it is unclear how the cell of the instant claim differs from any other cell since all cells are pleiomorphic in nature" (Paper 8, page 15) is not only factually baseless (see above), but also misleading, because the claims contain numerous additional elements that clearly distinguish the claimed cells from other cells such that the distinction does not depend only on the term "pleiomorphic." These rejections are improper and should be reversed.

The examiner has rejected claims 27 and 29 as being indefinite in the use of the term "morphology that is neither prokaryotic nor eukaryotic." Paper 8, page 15. The examiner asserts that it is unclear what is meant by the phrase since "prokaryotic" and "eukaryotic" are taxonomic terms and not morphology types. This assertion is simply incorrect. There are certain morphologies that are well-established as being characteristic of prokaryotic or eukaryotic cells. For example, the presence of a nucleus and other sub-cellular organelles such as mitochondria and endoplasmic reticulum is accepted as a characteristic "eukaryotic" morphology, and the absence of the same as a "prokaryotic" morphology. Also, certain cell shapes are accepted as characteristic "morphologies" of prokaryotic cells, for example the "coccoid" (spherical) form and the

"baccillus" (rod-like) form. Furthermore, when referring to the "morphology" of a cell, it is generally understood in the art that one is referring to the over-all morphology unless specified otherwise (for example, by discussing "morphological features"). Thus, the statement that the "morphology" of the cells is neither prokaryotic nor eukaryotic would be understood to mean that the overall morphology of the cell is not consistent with either, because certain key features are missing, or there is an unusual combination of features not found in either prokaryotes or eukaryotes. Discussion of cell morphology, consistent with this accepted meaning, appears at pages 2-5 and 28-29 of the specification. Any doubt as to the meaning of this phrase as used in the claims is removed by the disclosure, which states that the ultrastructure of isolated cells was extremely variable (page 29, lines 10-12), that the morphology was "of neither a prokaryotic nor a eukaryotic nature" (page 29, lines 16-17), and often "bizarre" (page 29, lines 21-22). Again, the language used in the claims is as definite as the subject matter permits and would be readily understood by a person having ordinary skill in the art. Therefor this rejection is improper and should be reversed.

**F. Rejections under 35 U.S.C. § 112, second paragraph (Written Description)**

The examiner has rejected claims 24-29 as containing subject matter that is not described in the specification. The examiner asserts that the claim limitation that the cell is not a transgenic cell is not supported by the specification. Paper 8, page 14. Examiner is applying an inappropriate *in haec verba* test for written description. Although the specific words "not a transgenic cell" do not appear in the specification, the specification as a whole reasonably conveys to a person having ordinary skill in the

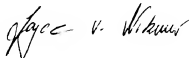
art that the method indeed employs cells that are not transgenic, and that this method was in the possession of the inventor at the time the application was filed. This is sufficient under the second paragraph of § 112:

"The test for determining compliance with the written description requirement is whether the disclosure of the application as originally filed reasonably conveys to the artisan that the inventor had possession at the time of the later claimed subject matter, rather than the presence or absence or absence of literal support in the specification for the claim language."

In re Kaslow 217 U.S.P.Q. 1089, 1096 (Fed. Cir. 1983) . Put another way, if a person having ordinary skill in the art would immediately discern the limitation from the original disclosure, the written description requirement is satisfied. Purdue Pharma L.P. v. Faulding Inc., 56 U.S.P.Q.2d 1481, 1483 (Fed. Cir. 2000) (no *in haec verba* test for written description – limitation need only be conveyed with reasonable clarity). The present specification clearly states that an aspect of the invention is a method for producing bacterial cells expressing animal and/or viral genes that does not require any step to introduce these genes into bacteria to create transgenic bacterial cells. See specification page 6, lines 24-30; page 9, lines 5-14; page, line 27 - page 11, line 27. The present specification also describes in detail the claimed methods, with specific examples wherein the cells produced clearly are not transgenic cells because nowhere in the methods used in these examples is there a step where a transgene is introduced into bacterial cells. See, e.g., Examples 1-5. A person having ordinary skill in the art would understand that this disclosure described cells that are not transgenic cells because they are not the product of traditional molecular biological transformation techniques. This rejection therefore is inappropriate and should be reversed.

**CONCLUSION**

For all of the foregoing reasons, the final rejections applied to the claims are without merit. Applicant respectfully requests that these rejections be reversed, and that the Board direct the examiner to issue a favorable action on the claims.

RESPECTFULLY SUBMITTED,			
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**Attachments:** Appendix A, copy of claims on appeal.

## **Appendix A**

### **Copy of the Appealed claims**

1. A method for producing a bacterium that contains a eukaryotic and/or viral gene, which comprises culturing virally-infected eukaryotic cells under low oxygen conditions to produce a bacterium containing a eukaryotic and/or viral gene.

2. The method according to claim 1, wherein said low oxygen conditions comprise anaerobic culture conditions with at least one exposure of the cells to aerobic or microaerophilic culture conditions.

3. The method according to claim 2 which further comprises subjecting the cells to an aerobic culturing step.

4. The method according to claim 2, wherein said anaerobic culture conditions comprise an atmosphere containing less than or equal to 1 v/v% oxygen, based on the total volume of atmosphere.

5. The method according to claim 4, wherein said atmosphere contains less than 0.1 v/v % oxygen, based on the total volume of atmosphere.

6. The method according to claim 1 wherein said virally-infected eukaryotic cells are retrovirally-infected mammalian cells.

7. The method according to claim 6, wherein said mammalian cells are human cells.

8. The method according to claim 1, wherein said eukaryotic cell is a mammalian, avian or fish cell.

9. The method according to claim 8, wherein said eukaryotic cell is an endothelial cell.

10. The method according to claim 1, wherein said eukaryotic cell is a mammalian brain capillary endothelial cell.

11. The method according to claim 1, wherein said virally-infected cell is infected with a virus selected from the group consisting of the murine L-cell virus, simian immunodeficiency virus (SIV), human immunodeficiency virus (HIV), Ableson murine leukemia virus and Moloney murine leukemia virus.

12. The method according to claim 11, wherein said virus is the murine L-cell virus.

13. The method according to claim 1, wherein said culturing step is carried out at a temperature between about 20 and about 50°C.

14. The method according to claim 1, wherein said culturing step is carried out at a temperature of about 37°C.

15. A method for producing a bacterium that contains a eukaryotic and/or viral gene, which comprises (a) culturing virally-infected eukaryotic cells under anaerobic conditions with at least one exposure to aerobic or microaerophilic conditions, (b) culturing cells from step (a) under aerobic conditions, and (c) isolating at least one bacterium that contains a eukaryotic or viral gene.

16. The method according to claim 15, wherein aerobic culturing step (b) is carried out in an atmosphere containing at least 0.1 v/v% oxygen, based on the total volume of atmosphere.

17. The method according to claim 16, wherein said atmosphere contains more than 1 v/v% oxygen, based on the total volume of atmosphere.

18. The method according to claim 15, wherein said virally-infected eukaryotic cell is a retrovirally-infected mammalian endothelial cell.

19. The method according to claim 15, wherein said virally-infected eukaryotic cell is a human brain capillary endothelial cell infected with the murine L-cell virus.

20. The method according to claim 1, further comprising filtering the cells cultured in step (a) prior to said aerobic culturing step (b).

21. The method according to claim 20, comprising filtering the cells through a 0.1 to 0.8  $\mu\text{m}$  filter.

22. The method according to claim 21, wherein said filter is 0.1 to 0.45  $\mu\text{m}$ .

23. The method according to claim 22, wherein said filter is 0.22  $\mu\text{m}$ .

24. A pleiomorphic cell that is not a transgenic cell, and is derived from a eukaryotic cell, containing at least one gene evolved from the genome of said eukaryotic cell, prepared by a process according to claim 1.

25. A pleiomorphic cell that is not a transgenic cell, and is derived from a eukaryotic cell, containing at least one gene evolved from the genome of said eukaryotic cell, prepared by a process according to claim 15.

26. A cell according to claim 24 that is a bacteria.

27. A cell according to claim 24 that has morphology that is neither prokaryotic nor eukaryotic.

28. A cell according to claim 25 that is a bacteria.

29. A cell according to claim 25 that has morphology that is neither prokaryotic nor eukaryotic.